



Special Microworlds Section

Microworlds: Towards a working definition

After announcing that this issue of the Clime News would be a Microworlds issue, a different kind of issue immediately came up. What exactly is a Logo microworld? Or how can we tell if a Logo activity is really a microworld or not? To find an answer to the first question, I went to the source - Seymour Papert's *Mindstorms* - for a definition. According to Seymour a microworld is "a computer based interactive learning environment where the prerequisites are built into the system and where learners can become the active, constructing architects of their own learning." (P. 122)

From this definition I can infer at least three characteristics of a microworld: (1) A microworld contains a set of tool procedures that accomplish some task. (2) There are stated or implied goals or objectives which may take the form of problems to solve or questions to explore. (3) The context is interesting and encourage student exploration. So, it seems to me that a candidate for microworld status should at least contain

these characteristics. Lets look at an example.

A "classic" is POLYSPI (short for polyspiral).

```
TO POLYSPI :DISTANCE :ANGLE :CHANGE  
FORWARD :DISTANCE  
RIGHT :ANGLE  
POLYSPI :DISTANCE + :CHANGE :ANGLE :CHANGE  
END
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All the user has to do is type POLYSPI followed by three numbers or inputs and the procedure will produce an intriguing result. Students can discover that stepping variables (holding some variables constant, while incrementing others) can be a powerful tool in testing hypotheses. Most

experts agree that POLYSPI is indeed a microworld. But how do we know for sure? Is there a STANDARD we can compare it to? When I posed this question to Ricky Carter (Lesley College, Cambridge, MA) he said that the issue for him is not whether an activity is a microworld or not, but rather how *microworldly* it is, and how we might make it more microworldly. For him microworlds involve a general (and developing) set of characteristics(see box) and no microworld has all of them.

I think that it is safe to say that POLYSPI satisfies the first six characteristics. But what about 7, 8, or 9? I think the answer here is not as clear. Does POLYSPI entice a student

Microworldly characteristics

Microworlds:

1. are rich for discovery
2. have structure (Logo procedures) that can be transparent to the user
3. are centered on powerful ideas
4. involve a set of engaging or "neat" phenomena
5. are easy to get started with
6. have many ways to explore an idea or solve a problem
7. entice student to ask questions
8. encourage users to explore on their own, build new structures, and personalize their learning in some way
9. helps students bridge the gap between intuitive and more formal understanding of mathematical ideas and principles

to ask questions? I suppose that it depends on the nature of the student, the environment that the teacher has set up, etc. But from my experience POLYSPI does encourage the student to ask questions. The same is true for question 8. Question 9 is more difficult. But if I can get a student to understand and appreciate the power of polyspi then the probability of statement 9 being true is more likely. So in my opinion, POLYSPI is an example of a very microworldly microworld.

So for our purposes we will use these characteristics as

our Standard for deciding on the level of microworldiness that a microworld has. Ultimately, the decision to classify as such is a subjective decision. But then it wouldn't be any fun, if it weren't open to some disagreement. So our working definition is (until we come up with a better one): a microworld (1) is a context or environment which consists of a set of Logo procedures and (2) provides some interesting questions to explore. What follows are descriptions of some microworlds that we have collected. You be the judge as to their "microworldiness".

But, before we start, a word from our "sponsors" ...

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